IN THE CLAIMS:

Please add the following new claims 60-98:

60. A microwave plasma processing apparatus comprising:

a plasma generation chamber separated from ambient air by a first dielectric material;

means for supporting a substrate to be processed;

microwave introduction means utilizing an endless annular wave guide provided outside of said first dielectric material which is provided with plural slots;

means for introducing gas into said plasma generation chamber; and

evacuation means for said plasma generation chamber;

wherein an interior of said wave guide is filled with a second dielectric material which is the same as or different from said first dielectric material.

61. A microwave processing apparatus according to claim 60, where the wave guide has a cylindrical shape.

62. A microwave processing apparatus according to claim 60, where the wave guide has a disk shape.

63. A microwave processing apparatus according to claim 60, where the wave guide has a shape which follows the exterior of the first dielectric material.

64. A microwave processing apparatus according to claim 60, further comprising a processing chamber connected to said plasma generation chamber.

65. A microwave processing apparatus according to claim 64, where the wave guide has a cylindrical shape.

66. A microwave processing apparatus according to claim 64, where the wave guide has a disk shape.

67. A microwave processing apparatus according to claim 64, where the wave guide has a shape which follows the exterior of the first dielectric material.

68. A microwave plasma processing apparatus comprising:

a plasma generation chamber separated from ambient air by a first dielectric material;

a substrate support for a substrate to be processed, located inside the plasma generation chamber;

an endless annular wave guide provided outside of said first dielectric material, which is provided with plural slots;

gas inputs situated to introduce gas into said plasma generation chamber;

an evacuation system situated to permit pressure reduction in said plasma generation chamber;

wherein an interior of said wave guide is filled with a second dielectric material which is the same as or different from said first dielectric material.

69. A microwave processing apparatus according to claim 68, where the wave guide has a cylindrical shape.

70. A microwave processing apparatus according to claim 68, where the wave guide has a disk shape.

71. A microwave processing apparatus according to claim 68, where the wave guide has a shape which follows the exterior of the first dielectric material.

72. A microwave processing apparatus according to any one of claims 60-71, wherein a ratio of dielectric constants of said first and second dielectric materials is approximately equal

to a reciprocal of a square of the ratio of circumferential lengths of said first and second dielectric materials.

73. A microwave processing apparatus according to any one of claims 60-71, further comprising a magnetic field generator.

74. A microwave processing apparatus according to claim 73, wherein the magnetic field in the vicinity of the slots has a magnetic flux density approximately equal to 3.57×10^{-11} (T/Hz) times of a frequency of the microwave.

75. A microwave processing apparatus according to any one of claims 60-71, wherein said substrate support is provided at a position distant from a generation area of said plasma.

76. A microwave processing apparatus according to any one of claims 60-71, further comprising an optical energy source to irradiate the substrate.

77. A microwave processing apparatus according to any one of claims 60-71, further comprising a high frequency supply connected to said substrate support.

78. A microwave plasma processing method wherein a substrate is placed in a microwave plasma processing apparatus comprising a plasma generation chamber separated from ambient air by a first dielectric material; means for supporting a substrate to be processed; microwave introduction means utilizing an endless annular wave guide provided outside of said plasma generation chamber and provided with plural slots; means for introducing gas for said plasma generation chamber; and evacuation means for said plasma generation chamber, wherein the interior of said wave guide is filled with a second dielectric material which is the same as or different from the first dielectric material, thereby effecting a plasma process.

79. A microwave plasma processing method according to claim 78, wherein the microwaves are introduced utilizing a cylindrically-shaped wave guide.

80. A microwave plasma processing method according to claim 78, wherein the microwaves are introduced utilizing a disk-shaped wave guide.

81. A microwave plasma processing method according to claim 78, wherein the microwaves are introduced utilizing a

waveguide which has a shape which follows the exterior of the first dielectric material.

82. A microwave plasma processing method according to claim 78, further comprising using a processing chamber connected to said plasma generation chamber.

83. A microwave plasma processing method according to claim 82, wherein the microwaves are introduced utilizing a cylindrically-shaped wave guide.

84. A microwave plasma processing method according to claim 82, wherein the microwaves are introduced utilizing a disk-shaped wave guide.

85. A microwave plasma processing method according to claim 82, wherein the microwaves are introduced utilizing a waveguide which has a shape which follows the exterior of the first dielectric material.

86. A microwave plasma processing method wherein a substrate is placed in a microwave plasma processing apparatus comprising a plasma generation chamber separated from ambient air

by a first dielectric material; a substrate support for the substrate to be processed; an endless annular wave guide provided outside of said plasma generation chamber and provided with plural slots; gas inputs to introduce gas into said plasma generation chamber; and an evacuation system situated to permit pressure reduction in said plasma generation chamber, wherein the interior of said wave guide is filled with a second dielectric material which is the same as or different from the first dielectric material, thereby effecting a plasma process.

87. A microwave plasma processing method according to claim 86, wherein the microwaves are introduced utilizing a cylindrically-shaped wave guide.

88. A microwave plasma processing method according to claim 86, wherein the microwaves are introduced utilizing a disk-shaped wave guide.

89. A microwave plasma processing method according to claim 86, wherein the microwaves are introduced utilizing a waveguide which has a shape which follows the exterior of the first dielectric material.

90. A microwave processing method according to any one of claims 78-89, wherein a ratio of the dielectric constants of said first and second dielectric materials is approximately equal to a reciprocal of a square of a ratio of circumferential lengths of said first and second dielectric materials.

91. A microwave processing method according to any one of claims 78-89, wherein said plasma process is effected under application of a magnetic field.

92. A microwave processing method according to claim 91, wherein the magnetic field in a vicinity of the slots has a magnetic flux density approximately equal to 3.57×10^{-11} (T/Hz) times of a frequency of the microwave.

93. A microwave processing method according to any one of claims 78-89, comprising a step of placing said substrate on said substrate support at a position distant from a generation area of said plasma.

94. A microwave processing method according to any one of claims 78-89, wherein the plasma process is effected under irradiation of the substrate with optical energy.